Nuclear energy issues - global dimensions and security challenges

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Nuclear Issues in the Post-September 11 Era

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In the fall of 2002, the *Fondation pour la Recherche Stratégique* convened a small group of high-level experts on nuclear policy issues to discuss the consequences of September 11 and of the "war on terrorism" for nuclear debates. Participants met in Paris on September 26-27, 2002, and later provided papers which are reproduced here.

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NUCLEAR ENERGY ISSUES – GLOBAL DIMENSIONS AND SECURITY CHALLENGES

Frank Umbach[*]

Introduction

Since September 11, 2001 nuclear, biological and chemical weapons pose a greater threat at any time before. In the 1960s, security experts anticipated that by the turn of the century 40-80 states would possess nuclear weapons. Today, only eight have acquired them: USA, Russia, China, France, Great Britain, Israel, India and Pakistan. Four countries – South Africa, Belarus, Ukraine and Kazakhstan — had given up their nuclear ambitions during the last decade.[1]

While nuclear power provides nearly 17 percent of the world's electricity demand[2], it is also the back door through which determined states could go to acquire nuclear weapons. As the result of civil and military programmes, the world has an estimated 3,000 tonnes of weapon-grades uranium and plutonium that can fall in the hands of international terrorists or so-called "rogue states" with nuclear ambitions. This amount of fissile material is enough to make thousands of bombs. But it is not all in secure storage — particularly not in Russia and other former Soviet states. In addition to dangers of stolen fissile material, attacked nuclear facilities by terrorists could release catastrophic amounts of radiation.

In some European states (such as Germany), civilian nuclear power programmes will be given up in one or two decades due to high costs, fears of radiation, and unresolved problems in nuclear waste storage.[3] If those nuclear

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1 See in detail Joseph Cirincione / Jon B. Wolfsthal / Miriam Rajkumar, "Deadly Arsenals. Tracking Weapons of Mass Destruction" (Washington D.C.: Carnegie Endowment for International Peace, 2002).

2 See OECD / IEA, "World Energy Outlook 2002" (Paris 2002: OECD / IEA, 2002), here p. 128.

3 See John V. Mitchell / Peter Beck / Michael Grubb, "The New Geopolitics of Energy" (London: Royal Institute of International Affairs / Energy and Environmental Programme, 1996), pp. 125 ff.; Peter Beck / Malcolm Grimston, "Future of Nuclear Energy – Powerful

programmes will end, it also will reduce at least the amount fissile material in Europe as well as the infrastructure as a potential targets for international terrorist groups. But at the same time, it may also create new problems for Europe's energy security. While the EU's dependence on energy imports (mainly oil and gas) fell from 60 percent of energy consumption in 1973 to 50 percent in 1999, the present strategic trends indicate the worrying prospect that this dependence may rise again to 70 percent by 2030 as Europe increasingly rejects indigenous coal and nuclear power.[4]

Meanwhile, the prospect of a widespread climate change resulting from an increase in greenhouse gas (GHG) concentrations in the atmosphere has become a major global concern. Against the background that global energy demand may rise dramatically in the 21st century and that nuclear power produces virtually non GHG emissions, it could, therefore, be in important energy source of future strategies to reduce GHG emissions.[5] Hence it can also help to strengthen Europe's and the global energy security by diversifying the energy mix and reducing high dependencies from fossil energy sources (i.e. oil and gas) imports from highly unstable regions (both politically and socio-economically), particularly the Middle East / Persian Gulf and Central Asia / Caspian Basin.

In 1999, nuclear energy supplied more than one sixth of global electricity and a substantial 30 percent of electricity in Europe. But in Eastern Europe and the Newly Independent States (NIS) of the Former Soviet Union, most nuclear power plants have already operated for more than half of their original design lifetimes. That is one of the reasons why Russia and other NIS will build new nuclear power stations in the next decades.

In other parts of the world such as in Russia and Asia, nuclear power programmes will either increase or initiated for the very first time in their countries. This may increase additional dangerous dimensions for the global security of the nuclear infrastructure and safe storage of fissile material. If may also offer new possibilities for nuclear ambitions of those countries. But at the same time it can also help to strengthen Europe's and the global energy security by diversifying the energy mix and reducing high dependencies from fossil energy sources (i.e. oil and gas) imports from highly unstable regions (both politically and socio-economically), particularly the Middle East / Persian Gulf and Central Asia / Caspian Basin.

Issues", *The World Today*, January 2001, pp. 25-27 and Roland Eggleston, "Germany: Plan to End Nuclear Power Raises Some Questions", RFE / RL Analyses, 16 June 2000.

4 See European Commission (Ed.), "Green Paper. Towards a European Strategy for the Security of Energy Supply", Luxembourg, November 2000 (COM(2000)769 final).

5 See Bob van der Zaan, "Nuclear Power and Global Warming", *Survival*, Autumn 2000, pp. 61-71 and Richard Rhodes / Dennis Beller, "The Need for Nuclear Power", *Foreign Affairs*, January-February 2000, pp. 30-44.

Against this ambivalent background of present strategic trends, I will give an overview of the contradicting developments in regard to the global use of the civilian nuclear energy. Thereby, I will pay particular attention to the nuclear programmes in Russia and those in North- and Southeast Asia where the civilian use of nuclear energy will be expanded in the mid-term future. In this light, I will also discuss some of the potential nuclear proliferation threats and dangers linked with the civilian nuclear programmes as well as the security aspects in the context of international terrorism and weapons of mass destruction (WMD).

Civilian Use of Nuclear Energy World-wide and in Europe

At present, 438 nuclear power plants are in operation around the world and additional 32 are being build — particularly in Asia and Eastern Europe. In Western Europe, around 150 nuclear power plants are producing approximately 30 percent of their electricity, whereas in the United States 188 nuclear reactors are providing 20 percent and in Canada 12 percent of their national electricity demand. The expansion of the European programmes of the civilian nuclear energy use followed the sharp increase in international oil and natural prices in 1973 which caused a thorough rethinking in the national energy strategies of the European states. In Western Europe, however, five of eight EU-states which have nuclear programmes, have declared a moratorium for the future use of nuclear energy. Only France (covering 79% of its electricity demand by nuclear energy), Great Britain (25%) and Finland have no intention to give up their civilian nuclear power programmes.[6] Germany (which produces 32% of its electricity by nuclear power) has pronounced to end its nuclear programmes in the year 2021. But whether renewable energy sources will be able to substitute the electricity generated today by nuclear power is highly uncertain.[7] According to the newest "World Energy Outlook 2002" of the OECD / IEA, for instance, renewable energy will play a growing role in the world's primary energy mix (and with non-hydro renewables growing faster than any other primary energy source), fossil fuels will remain the primary sources of global energy in the mid-term perspective. They will make up more than 90 percent of the increase in the global energy demand, rising from 75 million barrel per day (mb / d) to 120 mb / d in 2030.[8]

Presently, renewable energy sources are generating only 2-3 percent of its energy consumption in Germany (with water power almost 5%), almost 7 percent in the United States and 8 percent world-wide. Even many optimistic scenarios of the rising global energy consumption assume that these renewable energy sources may be able to provide a greater part of the energy and electricity generation up to 30-50 percent only *after* the year of 2030 — despite

6 See Breffni O'Rourke, "Finland, Bucking Energy Trends, Calls for More Nuclear Power", *RFE/RL Research Analysis*, 14 March 2002.

7 See also Stanley R. Bull / Lynn L.Billman, "Renewable Energy: Ready to Meet its Promise?", *The Washington Quarterly*, Winter 2000, pp. 229-244.

8 See OECD / IEA, "World Energy Outlook 2002", p. 27 f.

the forecast that it will grow faster than any other primary energy source, at an average rate of 3,3 percent annually until then.[9]

Nonetheless, Germany (with 19 nuclear power plants), Sweden (12 nuclear power stations), Belgium (7 nuclear reactors), Switzerland (5 nuclear power plants) and Belgium (7 reactors until 2025) as the latest EU state have declared to phase out their civilian use, whereas the United States, France (59 nuclear reactors), Japan (53), Great Britain 35 and Russia (29) will maintain their present civilian nuclear reactors or even expand the nuclear energy. Austria has suspended electricity imports from the Czech Republic to protest against the Temelin plant which produces one-fifth of the Czech Republic's energy demands. In general, the EU depends upon nuclear energy to generate 14 percent of its electricity power. Its gradual abandonment can leave Europe chronically short of energy and electricity. If renewable energy will not be able to substitute nuclear energy when the nuclear power reactors are phase out until 2021 in Germany and other states, Europe will become even more dependent on oil and gas imports in the future than today because coal plants face similar environmental pressure as Europe implements the Kyoto Protocol.[10] Those oil and imports will come primarily from Russia, the Middle East and Central Asia – the latter two regions are highly unstable both politically as well socio-economically. The other alternative option for Germany, for instance, is to import electricity from nuclear plants in France, the Czech Republic or Ukraine and Russia as probably the cheapest supplier. Such a development reveals one of the inherent contradictions of a national based decision to phase out the use of civilian nuclear energy: Germany, Sweden and other beginning to close the most secure nuclear plants, whereas in the future they might be forced to import nuclear electricity from the most unsafe nuclear power plants existing in Europe.

Against this background, the main conclusion of the so-called "Green Paper" of the EU", adopted on 29 November 2000 as the first major review of energy policy since the 1970s, is that the EU can only meet its climate change goals and avoid risky dependence on foreign oil and gas imports (especially not from "rogue states" like Iraq and Iran) if it takes drastic measures to curb energy consumption while keeping the nuclear option open. The "Green Paper" reminds European politicians, for instance, that avoiding 300m tonnes of carbon every year is equivalent to the emissions of 75 million cars, by using nuclear energy.[11]

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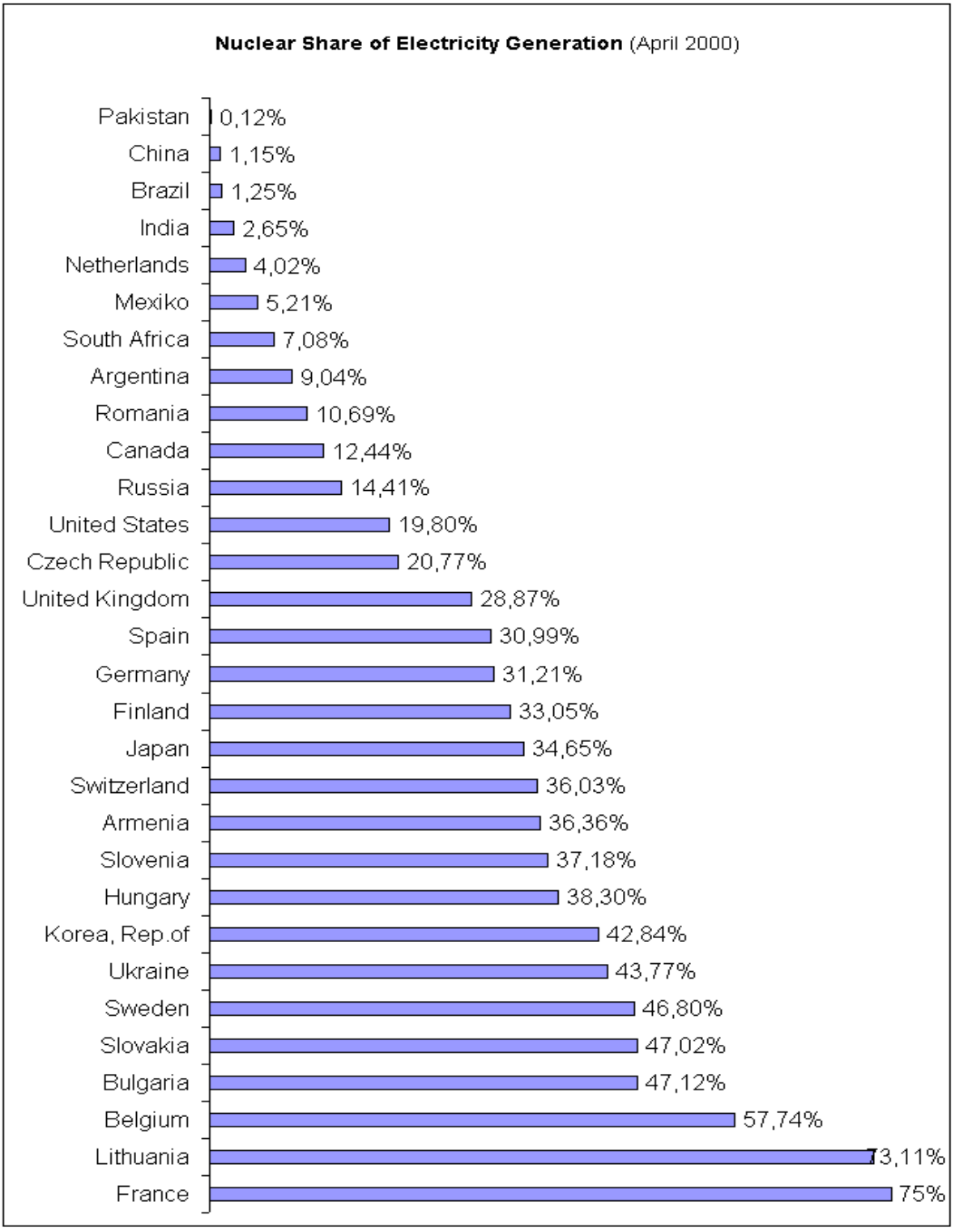
9 See OECD / IEA, "World Energy Outlook 2002" (Paris: OECD / IEA, 2002), p. 27 f.; Winand von Petersdorff, FAZ, 14.5.2002, p. 3 (English edition of the IHT); see also IAEA, "Climate Change and Nuclear Power", Vienna 2000, here p. 2 and Tony Weslowsky, "EU: Energy Deregulation May Be Bad News for Nuclear Power", *RFE/RL Analyses*, 1 November 2000.

10 See also Andrew Taylor, *Financial Times*, 27 June 2001, p. 8.

11 See European Commission (Ed.), "Green Paper. Towards a European Strategy for the Security of Energy Supply", adopted on 29 November 2000, COM (2000) 769 final, Brussels 2001.

Table 1 - *Nuclear Share of Electricity Generation (April 2000)*



Source: IAEA, "Climate Change and Nuclear Power", Vienna 2000.

Whilst the *EU Commission* hoped to initiate new debates on its energy security, the effect of the "Green Paper" in regard to public debates in Germany and other European states with a strong anti-nuclear sentiment has been marginal thus far. Sweden has closed the first of 12 plants but seems under some circumstances willing to extend the life of others if necessary and, at the same time, has invested in the German nuclear industry. Italy, which had three operating plants, has closed them and depends more than ever on imported oil for most of its energy needs. Austria has renounced nuclear energy, but is surrounded by countries that rely on it. Only Finland is building a new nuclear power plant (the fifth) and has recently called on the EU to consider more emphasis on nuclear power plants. This pro-nuclear attitude is explained by the fact that the Scandinavian country has a relatively tough target to achieve under the *Kyoto-Protocol* and has a lot of intensive energy-consuming industries (such as paper and pulp). It is therefore very sensitive to energy prices on order to being competitive enough on the future world market. France, which is more dependent on nuclear power than any nation in the world, will have to decide in the next years whether to replace its current generation of 59 nuclear plants and where to store highly dangerous long-term nuclear wastes.[12]

Meanwhile, nuclear power is also gaining new proponents in the US which is extending the service life of some of its 104 nuclear power plants. After the recent electricity crisis in California in 2001, nearly 60 percent of California's residents, who have traditionally been sceptical of nuclear power, are now in favour of new plants.[13]
In general, around the world, attitudes were beginning to shift already before September 11, 2001[14]. In Eastern Europe and the Newly Independent States, for instance, there are operating 68 nuclear power plants. And in fact, the issue of nuclear safety in the Central and Eastern European countries waiting to join the EU is a major factor in the enlargement debate. Thus, for instance, the EU has demanded a timetable for the final closure of the Chernobyl-style plant.[15] But for the Lithuanian government it is impossible to close the nuclear power plant by the suggested date of 2009.[16]

In the Middle East, South Asia and the Far East, there are currently 84 nuclear reactors. A further expansion of the nuclear energy use is planned especially in Asia — in particular in China, India, Japan, the Republic of Korea and even in

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12 See Joel Blocker, "France: Nuclear Power Meets Energy Needs and Provides Export Income", *RFE/RL Analyses*, 22 February 1999 and Catherine Field, IHT, 26 August 2002, p. 12.

13 See also John J. Fialka, *Wall Street Journal Europe*, 27 June 2001, p. 3; Julie Moffet, "United States: Nuclear Power Undergoing a Revival", *RFE/RL Analyses*, 22 February 1999 and Wolfgang W. Merkel, *Die Welt*, 2 May 2002, p. 31.

14 See also Barry James, *IHT*, 15 June 2000, p. 7; James Taylor, *Financial Times*, 27 June 2001, p. 8, and Winand von Petersdorff, *FAZ* (English-edition for the IHT), 14 May 2002, p. 3.

15 See also Ron Synovitz, "The East: EU Ties Membership to Improved Nuclear Safety", *RFE/RL Analyses*, 22 February 1999.

16 See also Valentinas Mite, "Lithuania: EU Urges Closure of Ignalina Nuclear Plant", *RFE/RL Analyses*, 3 April 2002.

some of the ASEAN states. In contrast to their expansion plans, Latin America and Africa account nowadays for less than 2 percent of global nuclear electricity capacity.

Table 2 - *World Electricity Balance 2000-2030*

	2000	2010	2020	2030	Average annual growth 2000-2030 (%)
Gross generation (TWh)	**15,391**	**20,037**	**25,578**	**31,524**	**2.4**
Coal	5,989	7,143	9,075	11,590	2.2
Oil	1,241	1,348	1,371	1,326	0.2
Gas	2,676	4,947	7,696	9,923	4.5
Hydrogen-fuel cells	0	0	15	349	-
Nuclear	**2,586**	**2,889**	**2,758**	**2,697**	**0.1**
Hydro	2,650	3,188	3,800	4,259	1.6
Other renewables	249	521	863	1,381	5.9
Own use and losses (Mtoe)	235	304	388	476	2.4
Total final consumption (Mtoe)	1,088	1,419	1,812	2,235	2.4
Industry	458	581	729	879	2.2
Residential	305	408	532	674	2.7
Services	256	341	440	548	2.6
Other*	68	89	111	133	2.3

* Includes transport, agriculture and non-specific uses of electricity.
Source: OECD / IEA, "World Energy Outlook 2002" (Paris 2002: OECD / IEA, 2002), here p. 124.

In general, if the world-wide trends (not just in Asia and the former Soviet Union) will not change substantially, the role of nuclear power on the global scale will decline in the next decades. It is expected that nuclear production will peak at the end of this decade at around 7 percent of its share of world primary demand and then decline gradually to 5 percent by 2030. But as the new "World Energy Outlook 2002" by the OECD / IEA has pointed out, the prospects for nuclear power are in particular very uncertain given the new ambivalent trends and divided opinions in the United States and Europe.[17]

In the light of the anti-nuclear sentiments in Europe, it remains uncertain in the politically most stable region in the world whether the nuclear energy will contribute to save the world from greenhouse effect and global climate change. Ironically, the civilian nuclear power programmes are particular strong in those states and regions which are seen politically as rather unstable. In the light of September 11, 2001, however, the world-wide security and safety of nuclear power plants and other nuclear related infrastructure has acquired new dimensions for the international security policy by undermining further the future of civilian nuclear power stations on a global scale. But as the same time, nuclear power is increasingly seen as a national energy source that strengthens the diversification of the national energy supply by making the Western and Asian countries less dependable from politically highly unstable oil and gas export regions such as the Middle East / Persian Gulf and Central Asia / Caspian Basin.

17 See OECD / IEA, "World Energy Outlook 2002", here p. 27 and 128.

Russia's Nuclear Power Programmes

Russia has currently 29 nuclear reactors which generate 11 percent of the country's electricity power. Concern over the waste in the Arctic as well as lingering doubt over the safety of nuclear power after the 1986 Chernobyl accident in Ukraine, many Russians are still wary about new nuclear power plant construction.[18]

In spite of this continued concern over the safety of nuclear power, Russia is planning several new nuclear projects. Construction of reactors at the Kyaltin and Kursk nuclear power plants and at the Rostov and Yuzhno-Ural nuclear plants will be finished by the year 2005 according to official plans. It has also unveiled plans to build a new plant at Sosnovy Bor near St. Petersburg. The latter plant is expected also to be used not just for producing electricity, but also in the decommissioning of old nuclear submarine reactors now left unused in Russia's part of the Arctic Sea. Russia will more than double its capacity to generate nuclear power of the next 20 years and to begin construction of new reactors with enhanced safety features. Russian experts also hope that they will export increasingly nuclear power to Germany and Western Europe after they announced to phase out their civilian use of nuclear energy.[19] A major continuing problem for the Russian nuclear power industry is the failure of its customers to pay for electricity, which has contributed to a lack of resources for maintenance, spare parts, and salaries.

Russia's Ministry of Atomic Energy also intends to construct floating nuclear power plants in remote areas of Russian Far North and East provinces. These small power plants shall provide electricity and heat to regions with underdeveloped infrastructure or to sites of big construction projects. Those plants can be moved to areas struck by natural disasters or other emergencies. This one reason why Russian officials see in their floating nuclear power plants significant export chances. But given that these plants will be powered by reactors running on highly enriched uranium (HEU), exports to foreign countries will increase the global proliferation of this sensitive fissile material because HEU can be easier converted to weapon-grade material than low enriched fuels. Sceptics are also quote physical protection measures, issues of ownership and liability as further problems. These potential "waterborne Chernobyls", which easily could also be raided by terrorists, are also posing many risks to the fragile Artic environment and public health — especially if extra radioactive waste will be dumped into the sea or on shore nearby. In these regions, Russian investigators found, for instance, virtually no controls over 85

18 See also Anthony Wesolowsky, "Russia: Nuclear Power Plans Move Forward", *RFE/RL Analyses*, 22 February 1999 and "Russia's Nuclear Future", Stratfor.Com, 8 December 2000.

19 See also Susan B. Glaser, *Washington Post*, 6 June 2001 (Internet-version) and Patrick E. Tyler, *IHT*, 28 May 2001, p. 5.

radio-thermal generators (delivering power to remote locations, such as a military base or a cliff-side beacon) installed in the 1960s and 1970s.[20]

Russia has also unveiled a controversial plan — that 90 percent of Russians oppose in public opinion polls — to reprocess spent fuel from countries outside the former Communist block to raise hard currency. Under the plan, any profit from reprocessing waste would be used to clean up plants and improve safety. The price for reprocessing would be significantly less than that charged by French and British companies, which handle most of the reprocessing in Western Europe. But not only Russia's environmentalists remain sceptical about the use of those funds. On the other hand, adding foreign spent fuel to the existing Russian stockpile might not be as so bas as the alternative: a nuclear waste storage crisis and no resources to deal with it. According to energy officials, taking in spent fuel from abroad is the only commercially sensible way to proceed. It is not clear thus far whether Russia intends to re-cycle the fuel for use in nuclear power stations or simply store it. But the United States has opposed those reprocessing spent fuel because the process attracts plutonium that could be used in nuclear weapons. For US experts it is simply "crazy to take more nuclear material into a country still unable to deal with nuclear waste it already has".[21] As the British expert Mark Galeotti has pointedly argued: "Russia's slow progress in securing its stockpiles of nuclear weapons and components is making the country one of the main potential sources of the raw materials for future 'megaterrorism'.[22] The liberal Russian lawmaker Sergei Metrokhin (from the *Yabloko party*) confirmed the country's safety standards as "non-existent" in February 2002 after he encountered no problems entering a secret nuclear waste dump in Krasnoyarsk region (central Siberia) despite having no authorisation to be there. He warned that any terrorist can repeat his trick.[23]

As the Bush Administration has officially declared, Russia's present nuclear stockpile is one of the most dangerous national security threats the United States is facing today. It includes more than 40,000 nuclear weapons, more than 1,000 tonnes of excess HEU enough to produce 20,000 nuclear weapons and vast quantities of material for biological and chemical warfare (40,000 tonnes). Russia has already committed itself to shipping 150,000 tonnes of low-enriched

20 See Anthony Wesolowsky, "Russia: Nuclear Power Plans Move Forward"; "Russia's Nuclear Future", Judith Matloff, *Christian Science Monitor*, 17 February 2000 (Internet-version) and Eduard Fesko, "Russian Floating Nuclear Reactors – Proliferation Risks", Monterey Institute of International Studies, 24 June 2002 (via Internet: - http://cns.miis.edu/pubs/week/020624.htm).

21 Quoted following Susan B. Glasser, *IHT*, 13 February 2001, p. 4.

22 Mark Galleotti, "Russia's 'Arsenal of Megaterrorism", *Jane's Intelligence Review*, September 2002, pp. 48-49.

23 Alexander Nikolayev, *Rossiya*, 5 March 2002, p. 4 and Francesca Mereu, "Russia: Nuclear Security System Comes under Question", *RFE/RL Analyses*, 18 February 2002.

uranium (LEU) derived from 500 tonnes of HEU from dismantled warheads to the United States under a 20-year agreement signed in 1993.[24]

The recent secret joint US-Russian operation of removing weapons-grade uranium (45 kilograms of high-quality Yugoslav uranium enough to make as many as three nuclear bombs) from an ageing reactor near Belgrade as part of two dozen reactors in 16 countries as subjects of similar missions has confirmed this US threat perception.[25] It was also the prime motive that the G8 meeting has decided to allocate US$20 billion over the next decade for the safe disposal of weapon's grade plutonium stocks in Russia and the rest of the FSU. Not so much the theft or disappearance of nuclear warheads and "suitcase bombs" pose the greatest danger, but rather the possibility of nuclear materials — even of relatively low yield — ending up in "dirty bombs" seems a more likely scenario in the near future[26]. Thus Chechen rebels caused panic and chaos by planting — but not detonating — a dirty bomb using dynamite and Caesium 137 in Moscow's Izmailovo Park in 1996.

The Russian Atomic lobby tries also to sell Russian reactors abroad such finishing several reactors in Iran, two others in China and building two reactors in India. As we all know, the United States has expressed concerns specifically about finishing the *Bushehr* reactors which could aid Iran in developing nuclear weapons. Since 1995, Russia's nuclear ties with Iran have been expanded when Moscow signed a contract with Teheran to complete the Bushehr nuclear power station that Germany companies abandoned with the beginning of the "Islamic Revolution" in 1979. But conservative politicians and hard-liners in the Russian media have dismissed the US criticism by arguing that their statements are part of an effort to shut Moscow out of the nuclear power game.[27] The Clinton-Administration was in particular worried about Russian plans to sell expensive laser equipment to Iran which is suited to producing fissionable material for

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24 See also "Managing the Global Nuclear Materials Threat. Executive Summary. A Report of the CSIS Project on Global Nuclear Materials Management", Washington D.C., January 2000; "Cooperative Science and Non-Proliferation. The ISTC / STCU Experiment", *Strategic Comments* (ed. by the IISS, London), August 2002; Jon B. Wolfsthal / Tom Z. Collina, "Nuclear Terrorism and Warhead Control in Russia", *Survival*, Summer 2002, pp. 71-83; "Reshaping U.S.-Russian Threat Reduction. New Approaches for the Second Decade". Findings Developed by a Joint Working Group (Washington D.C.: Carnegie Endowment for International Peace and the Russian-American Nuclear Security Advisory Council, November 2002), and Al J. Venter, "Soviet Nuclear Legacy Poses Deadly Threat", *Jane's Intelligence Review*, October 1999, pp. 12-16.

25 See John Warrick, *IHT*, 26 August 2002, p. 3; idem, ibid., 24-25 August 2002, pp. 1 and 5 and Mark Huband / James Lamont, *Financial Times*, 26 September 2002, p. 4. In context see also Lale Sabrihomuglu, "Turkey Detects Nuclear Material Trafficking", *Jane's Intelligence Review*, August 2002, pp. 30-32. Recently, the police in Tanzania have also seized 110kg of suspected uranium and arrested five people – see BBC News-World Edition, 14 November 2002.

26 See Svetlana Babayeva, *Izvestiya* (Moscow), 29 June 2002, p. 5; *IHT*, 28 June 2002, pp. 1 and 4; Nicolas George, *Financial Times*, 29-30 June 2002, p. 3; Peter Slevin, *Washington Post*, 25 June 2002, p. A15.

27 See also Peter Baker, *International Herald Tribune* (IHT), 23 October 2002, p. 5.

bombs. In its view, it was another indicator that Iran with one of the largest oil and gas resources in the world wants to make nuclear weapons rather than just to develop commercial plants. Iran, by contrast, has denied repeatedly to pursue a nuclear weapons programme and has put the Bushehr plant under the international agency's rules and safeguards.[28] In June 2001, the Russian Foreign Ministry even declared to share some nuclear technology with other countries under the aegis of the IAEA which can fasten the construction of new nuclear power plants around the world that would depend on Russia for nuclear fuel and waste disposal. The offer includes to share the knowledge of fast "breeders" and "closed fuel cycles"[29]. In October 2001, few weeks after the terrorist attack in New York and Washington, Russia announced a new military accord with Iran to deliver conventional weapon systems, including combat aircraft, missiles and other weapons, reaching $300 million in annual sales over the next five years and to deliver next month the first of two nuclear reactors for a 1,000megawatt power station at Bushehr.[30] Since that time, Iran has become the third largest arms customer of Russia (after China and India), including of sensitive technologies, equipment, and components for ballistic and a potential nuclear-weapons development. In July 2002, Russia further expanded its nuclear cooperation with Iran buy outlining plans to build three more reactors at the Bushehr site and two additional reactors (at a cost of together $8,5 billion) at a new nuclear power station at Ahwaz, a city 60 miles from its border with Iraq. These new plans openly contradicted earlier announced statements that Russia's nuclear cooperation with Teheran to develop a nuclear power industry would end with the Bushehr-project. At the same time, the Putin -government tried to defuse US concerns by insisting towards Teheran that Iran has to return the plutonium produced as a byproduct of nuclear power generations to prevent it from being used in weapons and has pressed Iran to allow extensive IAEA inspections of the plants.[31] Indeed, in the following month Iran signed an agreement with Iran guaranteeing the return of spent fuel from the Bushehr reactor.[32] However, it is not clear whether this agreement also covers the two newly build nuclear power reactors at Ahwaz. Finally, in February this year, Iran announced to have begun mining uranium at Savand (200 km from the city of Yazd in central Iran) and planning to build two plants in the city of Isfahan (central Iran) and Kashan (south of Teheran) for processing the uranium to provide fuel for generating electricity. As sources from Iranian dissident groups indicate, the nuclear fuel production plant at Kashan includes two large spaces that are 25 feet underground![33] Meanwhile, even Chris Patten, the EU's

28 See Judith Miller, *New York Times*, 19. September 2000 (Internet-edition).

29 See "Russia: Offer to Share Nuclear Energy Technology May Unseat U.S. Dominance in Industry", Stratfor.Com, 7 June 2001 and Vladimir Isachenkov, Associated Press, 17 December 2001.

30 See Michael Wines, ibid., 3 October 2001.

31 See Steven Lee Myers, *New York Times*, 26 July 2002 (Internet-edition) and Manfred Quiring, *Die Welt*, 1 August 2002, p. 5.

32 See Michael Wines, ibid., 22 August 2002 (Internet-edition).

33 See Nazila Fathi, ibid., 9 February 2003 (Internet-edition), *Neue Zuericher Zeitung* (NZZ), 11 February 2003, p. 2 and *Frankfurter Zeitung* (FAZ), 11 February 2003, p. 6 and NTI-Global Security Newswire, 15 August 2002.

commissioner for external relations, has also accused Iran seeking to acquire "non-conventional weapons"[34] though the EU is interested to build closer relations with Iran.

In addition to the regular nuclear power plants, Russia and particular its capital Moscow have nearly 40-45 nuclear reactors functioning at various scientific research institutes. Many of these reactors are located in residential sections of Moscow which has raised concerns about the potential risk posed by ageing equipment and spent fuel storage.[35] In general, the security and safety of many military facilities related to nuclear weapons is much better than civilian facilities with fissile material.

Outside of Russia, even more dangers exist. With no other help available, scientists in the Georgian town Mtskheta recalled that they guarded the reactor with sticks and garden rakes, whilst Abkhaz separatists overran the reactor in Sukhumi and then apparently took two kilogramme of HEU. Until today, nobody knows what happened to it.[36] In Armenia, the government has recently decided to reactivate the Metsamor nuclear plant (35 km west of the capital Yerevan), which provides 40 percent of the country's annual electricity production, but without receiving fresh nuclear fuel after lasting but unsuccessful negotiations with Russia. But in contrast to the EU and its safety as well as security concerns of the Armenian nuclear power plant located in a seismically active zone and being vulnerable to technical problems and serious accidents, Russia has no interest that the Metsamor nuclear power plant will be shut down – neither for financial nor for foreign policy reasons.[37]

Nuclear Power Programmes in Asia — The Rising Security Dimension

> "Nuclear trends in Asia are moving in the opposite direction. Asia contains the only nuclear weapon-state that is increasing its arsenal of nuclear and ballistic missiles (China); the two states which have recently chosen to declare their nuclear capabilities (India and Pakistan); the third (and now unique) 'threshold countries' (Israel); and the two countries found guilty of violating their non-proliferation commitments (Iraq and North Korea). In addition, South Korea and Taiwan ran military nuclear programmes in the 1960s and 1970s; Iran has long been suspected of activities prohibited under the NPT; and Japan is recognised as having a latent capability to produce nuclear weapons quickly. Lastly, the United States and Russia are major Asian powers as

34 See Nazila Fathi, ibid.

35 See Valentinas Mite, "Russia: Nuclear Reactors Based in Moscow Cause Concern and Fears", *RFE/RL Analyses*, 17 June 2002.

36 See Joby Warrick, *IHT*, 21 May 2002, pp. 1 and 3.

37 See Emil Danielyan, "Armenia: Yerevan to Relaunch Vital Nuclear Plant without Fresh Russian Fuel", *RFE/RL-Analyses,* 16 January 2003.

> well. Asia therefore comprises more nuclear powers or nuclear-capable states than any other region in the world."
> (Therèse Delpech, Director of Policy Planning at the Atomic Energy Commission, Paris, in an analysis of December 1998[38])

Although the radioactive leak from the Tokaimura uranium-processing plant 120 km north-east of Tokyo in 1999 was Japan's and Asia's worst nuclear accident (and the first in Asia to reach level four on the International Nuclear Event Scale) and simultaneously the world's worst since the 1986 Chernobyl explosion, Asia's enthusiasm for nuclear power has not been stopped. Every plant that began construction in 1998 was in Asia — two in China and one in Japan. Of the four new nuclear-power plants commissioned around the world in 1998, three were in South Korea.[39] Seoul has indeed one of the most ambitious nuclear energy programmes in the region and plans to double its present 15 nuclear power plants until 2015. In contrast to South Korea, however, Taiwan's President Chen-Shui-bian is a staunch opponent of nuclear power and has announced to overhaul its national energy policy[40] in his country that is one of the least energy-efficient economies in the world.

Statistics are often misleading as the case of the PR China shows. In 2001, the nuclear capacity for the most heavily populated country on Earth (more than one fifth of the present mankind) was slightly less than that of Finland. But at the same time, it is the biggest growth market for nuclear power. No other country in Asia or elsewhere in the world is expected to growth as fast as China. Several nuclear projects are under construction, with the involvement of Russian, French, and Canadian firms.

The first generation unit of the Lingao nuclear power plant in Guangdong province began commercial operation in May 2002, with a capacity of 1-GW. The second 1 GW generating unit will begin operating in March 2003 according to the official plan. Furthermore, an additional 600-MW generating unit at the Qinshan nuclear power plant in Zheijang province began operation in February this year, and another 600-MW unit at the same site is scheduled to begin delivering electricity in late 2002.[41]

Table 3 - *Total Primary Energy Demand in China (Mtoe)*

	1971	**2000**	**2010**	**2030**	**Average Annual Growth 2000-2030 (%)**
Coal	192	659	854	1,278	2.2

38 Therèse Delpech, "Nuclear Weapons and the 'New World Order': Early Warning from Asia?", *Survival*, Winter 1998-99, pp. 57-76.

39 See Chester Dawn u.a., "Nuclear Alert for Asia", in *Far Eastern Economic Review* (FEER), 14 October 1999, p. 18 f.

40 See Julian Baum, "No to Nuclear", in *FEER*, 2 November 2000, p. 42.

41 See also EIA, "China – Country Analysis Briefs", June 2002 (via Internet – http:/www.eia.doe.gov/emeu/cabs/china.html).

Oil	43	236	336	578	3.0
Gas	3	30	57	151	5.5
Nuclear	0	4	23	63	9.3
Hydro	3	19	29	54	3.5
Other renewables	0	1	4	9	6.8
Total primary energy demand	**241**	**950**	**1,302**	**2,133**	**2.7**

Source: OECD / IEA, "World Energy Outlook 2002" (Paris: OECD / IEA, 2002), here p. 249.

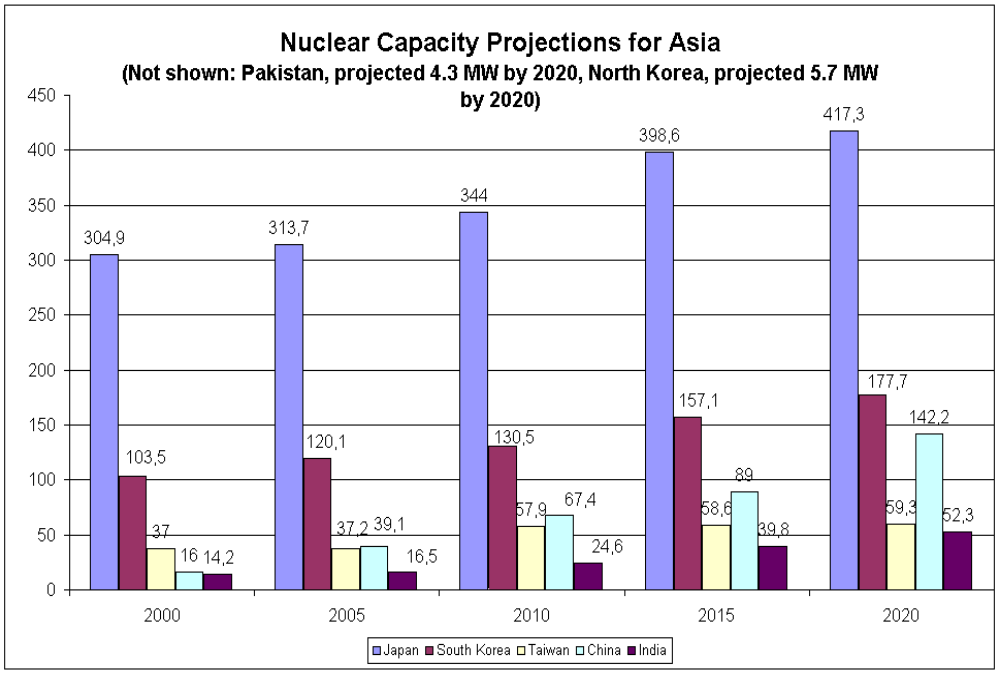
Table 4 - *Electricity Generation Mix in China (TWh)*

	1971	2000	2010	2020	2030
Coal	98	1,081	1,723	2,509	3,503
Oil	16	46	51	53	54
Gas	0	19	74	209	349
Nuclear	0	17	90	163	242
Hydro	30	222	333	511	622
Other renewables	0	2	10	16	42
Total	**144**	**1,387**	**2,282**	**3,461**	**4,813**

Source: OECD / IEA, "World Energy Outlook 2002" (Paris: OECD / IEA, 2002), here p. 249.

At present, China has a capacity of 2GW, which is just generating 1 percent of its electricity in the year 2000 due to the long lead times and high capital cost of nuclear plants.[42] Despite the expansion programmes of China's civilian nuclear power programmes from present six nuclear power plants to 10 in the year 2010 and 16-18 in 2025[43], the planned growth of nuclear energy to 11 GW in 2010, 21 GW in 2020, and 31 GW in 2030 *vis-à-vis* to the anticipated national energy consumption will grow from 1.5 percent in the mid of the 1990s to just 4-6 percent in 2020-2030.[44]

Table 5 - *Nuclear Capacity Projections for Asia 2000-2020*



Source: EIA – http: / / www.eia.doe.gov / cneaf / nuclear / page / nuc_reactors / china / china. html.

42 See OECD / IEA, "World Energy Outlook 2002", p. 264.

43 See Simon Rippon, "China: Ready for More Nuclear Power", *Nuclear News*, June 1995, pp. 32-33 (via Internet – http: / / www.nti.org / db.nuclear / 1995 / n9513965.htm).

44 See also *China Daily*, 7 January 2002 (Internet-version); OECD / IEA, "World Energy Outlook 2002", p. 264 and in context also Frank Umbach, "China's Energy Policy", in *Transatlantic Internationale Politik 2* (Summer) / 2001, pp. 85-89.

Moreover, China has now become one of seven countries that can design, build and manufacture nuclear power plants.[45] Reportedly at the end of last October, for instance, China is now offering assistance and support to build Pakistan's third nuclear power plant to overcome its energy shortage.[46] But at the same time, China's centralised political system has been undermined by mounting corruption and an ideological vacuum in the wake of the successful "socialist market reforms" during the last decade. Hence the capacity of "bad actors" to operate more freely has also grown in China.

Given South Korea's and Taiwan's past nuclear weapon programmes which had been stopped in the 1970s and the beginning of 1980s following US pressure, the lingering historic distrust, suspicion, rivalry in East Asia has fuelled the regional arms race with an increasing access to modern weapons of mass destruction, particularly ballistic missiles.[47] China's increasing ballistic and short-range missile arsenal at the Taiwan Strait has not only increased threat perceptions in Taiwan, but also in Japan and India with its own rising numbers of ballistic missiles and nuclear weapons. Last June, the chief secretary of the Japanese cabinet, Yasuo Fukuda, said that Tokyo could review its ban on nuclear weapons if necessary. In April before, Ichiro Ozawa, leader of Japan's second-largest opposition party, caused angry comments from China when he said that Japan could easily make nuclear weapons and surpass China's rising military might.[48]

Table 6 - *Nuclear Ambitions in North- and South Asia (in 1999)*

	Japan	**South Korea**	**India**	**Taiwan**	**China**	**Pakistan**
Number of Reactors under Construction	2	3	4	1	6	1
Number of Reactors in Operation	53	15	10	6	3	1
Nuclear Share of Electricity Generation	36%	41%	3%	25%	1%	1%

Source: Chester Dawson et. al., "Nuclear Alert for Asia", in: *FEER*, October 14, 1999, pp. 18-19 (19).

45 See *Beijing Review*, 26 February 1998.

46 See *Hindustan Times*, 28 October 2002 (Internet-version).

47 See also F. Umbach, "Nuclear Proliferation Challenges in East Asia and Prospects for Cooperation - A View from Europe", in: Kurt W. Radtke / Raymond Feddema (Eds.), "Comprehensive Security in Asia. Views from Asia and the West on a Changing Security Environment and Their Implications for Europe", Leiden-Boston-Köln 2000, pp. 66-133, and idem, "Strategic Trends of Global Denuclearization and Nuclearization - Implications for Japan's Security Policies, Regional Stability and the TMD-Debate in East Asia", *Hiroshima Peace Science*, No. 27, April 2001, pp. 63-118.

48 See Michael Richardson, *IHT*, 6 June 2002, p. 5; David Kruger, "Never Say Nuclear", *FEER*, 4 July 2002, pp. 16-17; Brad Glosserman / Yumiko Nakagawa, "Trust Japanese Democracy", *PacNet-Newsletters* (ed. by the CSIS-Hawaii, Honolulu), No. 26, 28 June 2002 and Robyn Lim, *IHT*, 13 June 2002, p. 8.

Indeed, of 17 countries with nuclear weapons or weapon programmes world-wide, seven are in the Asia-Pacific region; of the 28 with missile programmes, 16 are in the region; of the 16 with chemical weapons programmes, 10 are in the region, and of the 13 with biological weapons programmes, eight are in the region and more than 50 percent of potential proliferators are in the same according to the South Korean Defence Ministry.

At present, China has the largest nuclear weapon programme as it is developing two ICBMs (both having a MIRV capability), a SLBM (also with a potential MIRV capability), a strategic nuclear submarine and air-launched cruise missiles (with a potential warhead configuration). Theoretically, China as the only declared nuclear weapons state under NPT in Asia might in the theoretical position to increase its nuclear arsenal from 300 to 600-900 strategic warheads within the next 15 years if is deploying MRV / MIRV-warheads on its new ICBMs and SLBMs. Given the US ballistic missile defence plans and Russia's declared withdrawal from START-II which prohibited MRV / MIRV-warheads on ICBMs[49], it seems now even more likely that China may also opt to MRV / MIRV its new generations of ICBMs and SLBMs. But even regardless of this MRV / MIRV question for China's future strategic nuclear arsenal, China's rising military capabilities are already casting a shadow on the regional security environment and particularly on the future bilateral relationship between Beijing and Tokyo and can so fuel nuclear weapons ambitions in Taiwan and Japan or fasten and expanding those already existing in India.[50]

In addition, the new North Korean crisis after Pyongyang has confessed on October 4, 2002 (the U.S. government made it public on October 16, 2002) to have an ongoing uranium-based nuclear weapons programme has further undermined the global and regional non-proliferation efforts (including the October 1994 Agreed Framework and the KEDO programme for the Korean peninsula), and regimes (such as the NPT) and has questioned again whether the hitherto rather limited inspections of the UN and the IAEA can really prove the existence and non-existence of secret nuclear weapons programmes.[51]

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49 To the background see F. Umbach, "Future Military Reform: Russia's Nuclear and Conventional Forces" (Camberley / Surrey: Conflict Studies Research Centre / Defence Academy of the United Kingdom, D65, August 2002), here p. 19ff.

50 See also F. Umbach, "US and European Assessments of China's Political Intentions, Military Capabilities, Arms Control and Non-Proliferation Policies", *Transatlantic China Workshop* – German / European Expert Group, 9 September 2002 (forthcoming on the German and English web-sites of the DGAP: www.dgap.org), 25 pp.; idem, ''Nuclear Proliferation Challenges in East Asia and Prospects for Cooperation - A View from Europe", pp. 101 ff., and idem, "Strategic Trends of Global Denuclearization and Nuclearization - Implications for Japan's Security Policies, Regional Stability and the TMD-Debate in East Asia", pp. 86 ff.

51 See F. Umbach, "US-Foreign and Security Policy of the Bush-Administration: Unilateralism, Bilateraism, Multilateralism or Minilateralism *vis-à-vis* North Korea and its Nuclear Ambition?", paper presented at the "Asia Pacific Security Forum — 2002 Roundtable on the Asian Pacific Security Environment: Emerging Realities", organized by the Institute for National Policy Research (INPR, Taiwan), The Pacific Forum CSIS (Hawaii,USA), Institute for Strategic and Development Studies (Manila, Philippines) and the Institut Français des

Table 7 - *Status of Nuclear Power and Research Reactors in the ASEAN-States*

	Power Reactor	**Research Reactor**
Brunei	-	-
Cambodia	-	-
Indonesia	-	3 units in operation
Laos	-	-
Myanmar	-	-
Philippines	1 unit moth-balled	1 unit under repair
Singapore	-	-
Thailand	-	1 unit in operation, 1 unit in pending construction
Vietnam	-	1 unit in operation

Source original: Malaysian Institute for Nuclear Technology Research (1999).

Source here following: Mohd Zamzam Jaafar, "ASEAN", in Paul B. Stares (Ed.), "Rethinking Energy Security in East Asia", Tokyo-New York 2000, pp. 117-140 (131).

Although the ASEAN countries see themselves in the use of nuclear energy programmes a number of problems and challenges due to the demanding and expensive requirements in terms of developing new infrastructure and facilities as well as training a disciplined and specialised workforce making nuclear energy rather one of the least attractive energy options especially to private-sector companies, nuclear power planning remains attractive and ongoing activity.[52] Thus far, the Philippines is the only ASEAN country to have built a nuclear power plant, albeit it has yet to be commissioned. But Indonesia, Malaysia, Thailand and Vietnam have all built a research reactor or one which is under construction and repair. However, all ASEAN countries are members of the *NPT*, and all except Brunei, Cambodia, and Laos are members of the *IAEA*. Furthermore, all ASEAN members signed the *Treaty on the South East Asia Nuclear Free Zone* on December 1995 and reaffirmed the *Declaration on the Zone of Peace, Freedom and Neutrality* (*ZOPFAN*) signed in 1971.[53]

After dropping a plan in 1997 to build 12 nuclear reactors along the north coast of earthquake-prone Java-island which is one of the most densely populated regions (70% of Indonesia's population of 210 millions) and studded with many active volcanoes, Indonesia has announced in January 2003 to build its first nuclear plant on the Muria Peninsula in central Java, beginning in 2010 and becoming operational in 2015.[54] Given the concerns in regard to the seismically active region of Java, the widespread political turmoil, financial crisis, endemic corruption and communal violence in Indonesia — as the Islamic terrorist

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Relations Internationales (IFRI, Paris / France) in Hawaii, 9-10 November 2002 (the paper is forthcoming on the web-sites www.inpr.org.tw and www.dgap.org), 14 pp.

52 See also Michael Roston, "Nuclear Archipelagoes? Secure Nuclear Materials in Southeast Asia", *PacNet-Newsletter*, No. 25, 21 June 2002 and Brad Glosserman, "Solving Asia's Nuclear-Waste Dilemma", *ibid.*, No. 24, 15 June 2001.

53 See Mohd Zamzam Jaafar, "ASEAN", in Paul B. Stares (Ed.), "Rethinking Energy Security in East Asia", Tokyo-New York 2000, pp. 117-140.

54 See *CNN*, 7 January 2003 (Internet-edition).

bombing on the island of Bali (which was seen until then as one of the very few safe heavens in the country) are not a perfect environment for operating nuclear power plants.

Meanwhile, however, Myanmar has shown a strong interest at nuclear energy programmes. In December 2001, Russia announced that it will sell a nuclear research reactor to Burma.[55] Even in the case that Myanmar may not become a Southeast Asian nuclear rogue state, the movement of radioactive and fissile materials into and out of this military state must be worrying in the light of widespread corruption and the risks of terrorists using improvised nuclear devices and "dirty bombs". But it is questionable whether the military junta has the financial resources or the means to achieve its nuclear goals. But they may favour such an expensive programme because the possession of nuclear weapons can extend the already isolated regime's importance and influence in the region.

Moreover, Vietnam has also announced to expand its civilian programmes to fuel its expanding economy. But at the same time, regional security experts distrust Vietnam that it will use its nuclear weapon programmes just for civilian purposes given its historical enmity with China as the rising potential hegemon in the region. Hence Southeast Asia is in the need of comprehensive procedures for protecting, controlling, and accounting fissile materials (MPC&A) that could be used to build nuclear and "dirty bombs".[56] The ASEAN Declaration on *Joint Action to Counter Terrorism* of 2001 is an important step to enhance security co-operation in the region and to commit its members to the prevention of terrorism, but it has failed to address nuclear risks specifically.

55 See also "Russia-Myanmar Reactor Leaves China on Sidelines", Stratfor.Com, 17 May 2002.

56 See also again Michael Roston, "Nuclear Archipelagoes? Secure Nuclear Materials in Southeast Asia", and Brad Glosserman, "Solving Asia's Nuclear-Waste Dilemma".

Table 8 - *Comparison of Various Proposals for an ASIATOM-Concept*

	Area of Cooperation								
Proposals	Safety	Public Relations	Industry Cooperation	Spent Fuel Management	Waste Management	Regional Safeguards	Pu-Management	Non-proliferation Export Control	Nuclear Disarmament
ASIATOM (Kaneko)	X	X	X	X	X	X		X	X
PACIFIATOM (Kano)	X	X	X	X	X			X	
Ryukichi Imai (Japan)	X		X(enrich)	X	X	(X)			
Atsuyuki Suzuki (Japan)				X	X(R&D)			(X)	
Kunio Uematsu (Japan)	X			X				X	
PACATOM (Manning)	X			X	X	X	X	X	X
William Dirks (USA)	X			X	X	(X)	(X)	X	
Jor-San Choi (USA)	X			X	X	X	X	X	
Y.M. Choi (S. Korea)	X		X(R&D)	X	X		X	X	
J. Charlson (Australia)	X			X	X	X	X	X	

Source: Park, Hahnkyu "Comprehensive Security and Regional Nuclear Cooperation in East Asia: the Case of South Korea" Prepared for a Workshop on "Asian Concepts of Comprehensive Security and Their Implications for Europe" Zushi, Japan, January 23-25, 1998.

Along with concerns about the rising numbers of new nuclear power plants and the uncertain strategic environment with historical rivalries among China, India, Japan, and South Korea as well as the hotspots of the Taiwan Strait and the Korean peninsula, there are also increasing worries over the fact that many of the regional nuclear power programmes have questionable oversight and control — often linked with poor transparency making it difficult to analyse, confirm and improve their safety record. The amount of radioactive waste will accumulate over the next two decades even if no additional nuclear capacity will be installed in North- and Southeast Asia. This waste will contain 450 tons of plutonium until 2010. The search for long-term storage facilities has already become a pressing issue for regional governments such as Taiwan that wanted to export to and store its nuclear waste either in North-Korea or Russia. Against this background, the proposal of an *ASIATOM* organisation (following the

EURATOM model in Europe – see *table 8*) is under discussion for several years.[57]

Conclusions and Perspectives — September 11 and the Security Implications

The expansion of the global civilian nuclear power programmes — particularly in Asia, Russia and other NIS — can increase the worldwide dangers of control and safe storage of fissile material. But the present civilian nuclear power stations need to be modernized to combat effectively the risk of nuclear terrorism and to ensure the security and safety of nuclear facilities as well as material anyway as the IAEA has recommended at the end of 2001.[58] The terrorist attacks in New York and Washington have highlighted new urgent priorities in international security and for Russia too. Although Russia employs physical, procedural, and technical measures to secure its weapons against an external threat, those measures date often from the Soviet era and are not designed to counter the pre-eminent threat faced today — an insider who attempts unauthorized actions.[59] But Russia is no longer the only security challenge in this respect. The IAEA has found more than 100 countries having no minimum infrastructure in place to properly control radiation sources. Through its programmes to help countries improve their national facilities for radiation safety and security, many IAEA countries in Africa, Asia, Latin America and Europe are making progress to strengthen their capabilities to control and regulate radioactive sources. But more than 50 countries that are not IAEA member states do no benefit from IAEA assistance and experiences and likely to have no comparable or regulatory infrastructure at all.[60]

Although a recent panel of 19 US nuclear experts (mostly from the nuclear power industry) concluded that US reactors faced no meltdown risk from a terrorist scenario in which hijackers might crash an airliner into a reactor[61], the situation might be at least different in other countries and regions such as Russia. Its air defence, for instance, is in a critical condition and cannot effectively safeguard strategic sites against suicide hijacker attacks. Even the Chief of Russia's Air Force, Anatoly Kornukov, admitted in an interview that a plane taking off somewhere in the Moscow region could hit the Kremlin before it could be intercepted by air defence systems because the level of combat

57 See F. Umbach, "Konflikt oder Kooperation in Asien-Pazifik? Chinas Einbindung in regionale Sicherheits strukturen und die Auswirkungen auf Europa" ("Cooperation or Conflict in Asia-Pacific. China's Tying into Regional Security Structures and the Implications for Europe"), (Muenchen: Oldenbourg-Verlag, 2002), here pp. 295 ff. (chapter 6.5). See in particular also the web-site — http://www.cscap.nuctrans.org/index.htm.

58 See Matthew Jones, *Financial Times*, 1-2 December 2001, p. 4.

59 See "Annual Report to Congress on the Safety and Security of Russian Nuclear Facilities and Military Forces", *National Intelligence Council*, Washington D.C., February 2002 (http://www.cia.gov/nic/pubs/other_products/icarussiansecurity.htm).

60 See "Controlling Radioactive Sources", *IAEA-Bulletin* 44/1/2002, p. 2 f. (3).

61 But the report has been heavily criticized by other US experts – see "Threat Assessment: Nuclear Plants Are at Risk, Experts Say", Global Security Newswire, 23 September 2002.

readiness requires 10-12 minutes to bring it up.[62] From 1994-1998, the Russian air defence force dramatically declined: the number of fighter aviation units was reduced by 2.8 times, that of air defence missile units by 2.1 times; in 2000, the air defence troops received only 65 percent of required funding; purchases of new weaponry have stopped; obsolete weaponry systems account for 65-80 percent of the air defence troops' armoury, and only 80 percent of the armament is combat ready, while Air Force units have received only between 6-8 percent of the needed fuel. Hence, in 1999 and 2000 an average fighter pilot spent just 11-12 hours annually in the air. Meanwhile, nearly half of the most important state objects have been deprived of direct air defence missile protection. A few days after the terrorist attack on the United States, a Russian analysis warned:

> "... even if unprecedented measures are taken to restore the resources of air defence, these efforts will not result in effective protection against air terrorism. Russia is too vast a country, and the number of strategically important or hazardous facilities on its territory runs to many hundreds. It is impossible to supply each such site with an air defence missile brigade or a fighter regiment equipped with state-of-the-art weaponry and placed on high alert status".[63]

European countries, too, face similar security challenges. France, for instance, installed an anti-aircraft missile to protect the nuclear processing plant at La Hague from possible attacks by terrorists and kept 10 fighter aircraft on 24-hour standby.[64] However, given the density of Europe's population centres and the industries, the armed forces would have very limited reaction time if terrorists are using small aircraft flying under the radar.

According to the same US expert panel of nuclear experts, terrorists could do little to create a public health hazard by damaging spent fuel shipments because it is cooled for several years before shipping to allow its temperature and radioactivity levels to decrease. Spent nuclear fuel cannot explode and does not contain radioactive liquid materials that could be released. However, international experts are divided in regard to the risk to the public from attacks on nuclear power plants — partly to the reason that the targets vulnerable to the widest range of threats were not nuclear but facilities where chemicals were manufactured and stored due to much less improved security during the last decade.[65] But as a new analysis by David Albright, a physicist and the President of the Institute for Science and International Security in Washington D.C., has convincingly argued in regard to Al Qaeda's nuclear ambitions, Bin Laden's terrorist group had only limited technological capabilities in Afghanistan to

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62 See the interview of Kornukov by Sergei Sokut, *Nezavisimaya gazeta*, 13 September 2001, p. 1.

63 So the analysis by Mikhail Khodarenok, *Nezavisimoe voennoe obozrenie*, No. 34, 14 September 2001, p. 5. See also Nikolai Novichkov, "Russian Air Forces Facing Protracted Crisis", *Jane's Defence Weekly*, 23 January 2002, p. 4.

64 See Victor Mallet / Robert Graham, *Financial Times*, 20-21 October 2001, p. 3.

65 See also Matthew L. Wald, *IHT*, 25 October 2002, p. 3.

produce WMD, but "if it had remained in Afghanistan, it would have likely acquired nuclear weapons eventually". He concluded by pointing out:

> "A critical lesson of the documents found in Afghanistan is that groups like Al Qaeda see great value in the use of nuclear weapons. Al Qaeda, its spin-offs, and like-minded terrorist groups can be expected to struggle to enhance their chances of acquiring and using nuclear explosives, regardless of the costs to themselves".[66]

Furthermore, those documents found and seized in Afghanistan suggest that Al Qaeda was seriously considering attacks on nuclear power stations in Europe and the United States.[67] As an envoy of Chechen leader Aslan Maskhadov has also warned recently that future Chechen attacks in Russia may also include nuclear facilities as the next targets.[68] Meanwhile, the United States and Russia have agreed to set up a joint task force to prevent radioactive materials from falling into the hands of terrorists to produce "dirty bombs" (that would not have the destructive power of a nuclear weapon, but would spread toxic radiation when exploded). Given the widespread worldwide availability of radioactive material that could be used in a dirty bomb , the *IAEA* has demanded a new "cradle-to-grave control of powerful radioactive sources to protect them against terrorism and theft."[69]

Furthermore, despite signs of a growing and genuine commitment PR China's to non-proliferation as the introduction of a national control regime governing its export of missiles and missile-related technologies demonstrated last August, a reversal or at least a hiatus in China's adherence to international norms and bilateral commitments cannot be excluded in the near- and mid-term future. At present, for instance, Beijing's is still unwilling to sign a groundbreaking international code of conduct aimed at preventing the proliferation of ballistic missiles (*ICOC*). Moreover, in the future, internal turmoil, persistent interagency differences, changes in U.S. foreign and security policies, or developments in China's relations with other nuclear powers could undermine Chinese increasing willingness to participate constructively in international non-proliferation and export control arrangements as well as in regard to Beijing's promises to enforce its non-proliferation commitments internally. Given these security challenges associated with the proliferation of destructive technologies to hostile states or terrorist groups, an intensified transatlantic dialogue on China and proliferation as well as with Beijing on these various topics should be a high priority in the future for both sides of the Atlantic.

66 David Albright, "Al Qaeda's Nuclear Program: Through the Window of Seized Documents", *NAPSNET-Special Report*, 19 November 2002.

67 See *ibid*. and *Der Tagesspiegel*, 9 September 2002, p. 5.

68 See *Global Security Newswire*, 30 October 2002.

69 So the director-general of the agency, Muhammad el-Baradei – quoted following Serge Schmemann, NYT, 26 June 2002 (Internet-edition).

APPENDIX

Nuclear issues in the post September 11 world
Fondation pour la Recherche Stratégique, Paris, 26-27 September 2002

Thursday, September 26

1000-1115: General outlook
Michael May, CISAC

1130-1230: Nuclear energy issues
Frank Umbach, DGAP

1330-1500: "Nuclear control" issues
Alexander Pikayev, CEIP; Jon Wolfstahl, CEIP

1515-1700: Nuclear deterrence issues
Brad Roberts, IDA; Michael Wheeler, SAIC

Friday, September 27

1000-1130: Regional nuclear issues
William Walker, University of Saint-Andrews : South Asia
Ariel Levite, IAEC (formerly CISAC) : the Middle East

1145-1230: Concluding session
Lewis Dunn, SAIC

List of participants:

AZAIS Antoine, Délégation aux affaires stratégiques, Ministère de la défense, France

DUNN Lewis, Science Applications International Corporation, United States

LATHAM Elizabeth, Center for Strategic and International Studies, United States

LEVITE Ariel, IAEC (formerly at the Center for International Security and Arms Control), Israel

MAY Michael, Center for International Security and Arms Control, United States

MAYSOUNAVE Marie-Hélène, Centre d'analyse et de prévision, Ministère des affaires étrangères, France

PICARD Michel, Commissariat à l'énergie atomique, France

PIKAYEV Alexander, Carnegie Moscow Center and IMEMO, Russia

ROBERTS Brad, Institute for Defense Analyses, United States

SABATIE-GARAT Pierre, EADS, France

SITT Bernard, Commissariat à l'énergie atomique, France

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UMBACH Frank, Research Institute of the German Council on Foreign Relations, Federal Republic of Germany

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WHEELER Michael, Science Applications International Corporation, United States

WOLFSTAHL Jon, Carnegie Endowment for International Peace, United States

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